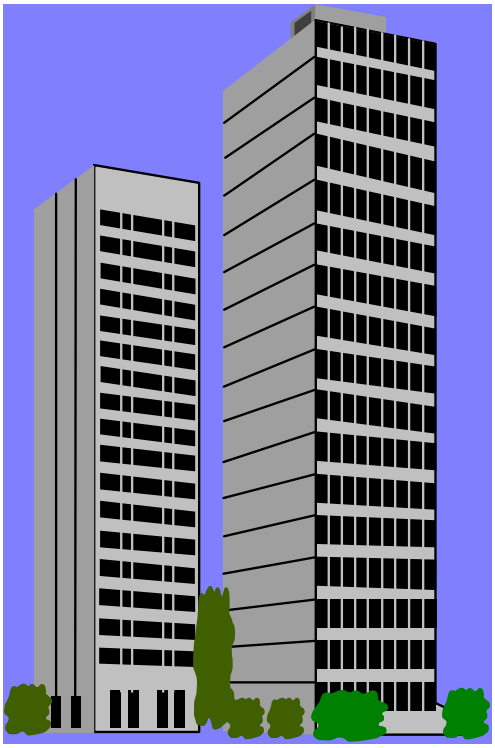
INDOOR AIR QUALITY ASSESSMENT

Bristol County 3rd District Court
75 North Sixth Street
New Bedford, Massachusetts



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
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Background/Introduction

At the request of James Sheerin, Clerk Magistrate, an indoor air quality assessment was done at the Bristol County 3rd District Court, North Sixth Street, New Bedford, Massachusetts. This assessment was conducted by the Massachusetts Department of Public Health (DPH), Bureau of Environmental Health Assessment (BEHA). BEHA staff received numerous complaints from employees concerning urine-like odors in occupied areas, rodent infestation and eye and respiratory irritation.

On March 22, 2000 a visit was made to this building by Michael Feeney, Chief of Emergency Response/Indoor Air Quality (ER/IAQ). Mr. Feeney was accompanied by Thomas Alphonse, Assistant Clerk Magistrate. Due to concerns about carbon monoxide in the building, Mr. Feeney returned to conduct further air testing on March 29, 2000. Mr. Feeney was accompanied during the subsequent inspection by Mr. Sheerin.

This building is a two-story courthouse built in 1983, located in downtown New Bedford. The second floor has judge's chambers; the clerk's offices; upper vault; front lobby; probation offices; courtrooms 1, 2 & 3; the switchboard room and several office areas. The first floor contains court rooms 4 and 5, the juvenile court; the lower vault, lockup control; prisoner holding cells, indoor garage; and the boiler room. Above the second floor is a penthouse/attic that contains the building's heating, ventilation and air conditioning (HVAC) equipment in two separate rooms. The chiller for the air-conditioning system is located within a cyclone fence enclosure outside near the boiler room. The boiler room contains gas-fired boilers, a compressor, emergency electric generator and mechanical pumps for the HVAC system. Some windows in the building are openable.

Methods

Air tests for carbon dioxide were taken with the Telaire, Carbon Dioxide Monitor and tests for temperature and relative humidity were taken with the Mannix, TH Pen PTH8708 Thermo-Hygrometer. Carbon monoxide levels were measured with a Defender, Multigas Meter.

Results

The courthouse has a population of approximately 280 employees and is visited by over 1,200 members of the public daily. The tests were taken under normal operating conditions. Test results appear in Tables 1-4. Air sample results are listed in the tables by location or by the person's name in which the air sample was taken.

Discussion

Ventilation

It can be seen from the tables that carbon dioxide levels were elevated (i.e. greater than 800 parts per million parts of air [ppm]) in fifteen out of nineteen areas sampled on March 22, 2000 and four out of nineteen areas sampled on March 29, 2000. These carbon dioxide levels are indicative of an overall ventilation problem in the building.

Fresh air for most of the building is provided by air handling units (AHUs) located in the building penthouse. Several areas in the basement (e.g., the vault) area are supplied by an AHU located in the ceiling of the boiler room. These AHUs are connected to ducts that supply fresh air to rooms through wall and ceiling mounted air diffusers. Heating and cooling in occupied areas is supplemented by the use of fan coil units (FCUs), which are installed along exterior walls. Airflow in the building is

enhanced by the operation of FCUs, particularly in private offices without ducted exhaust vents. While fresh air supply vents were operating, all FCUs examined in the building were deactivated.

Return vents that draw air back to the AHU are located throughout the building. Each AHU was examined. Exhaust vents apart from the AHU appear to be installed in return air ductwork according to blueprints. The fixed lovers in the east wall of the penthouse were designed as an exhaust vent in the south penthouse mechanical room. A combination supply and exhaust vent in the north penthouse mechanical room is located on the east wall of the penthouse (see Appendix A) (SBRAA, 1981a). Each AHU has three ducts connected to its casing: a fresh air duct, an air distribution duct and a return air duct. The fresh air intake and exhaust vent for the AHU equipment in the north penthouse mechanical room were located within several feet of each other (SBRAA, 1981a). This close configuration of intake and exhaust vents can lead to the capture of exhaust air by the fresh air intake (called entrainment) under certain weather conditions and can also lead to the distribution of odors generated in one area into another.

Exhaust ventilation motors on the roof were designed to provide local exhaust for restrooms or kitchens only. The blueprints also confirm that all of the rooftop exhaust motors (see Picture 1 for an example) serve as local exhaust vents only (see Appendix B) (SBRAA, 1981b). During both assessments, over half of the local exhaust vent motors were deactivated, indicating either the motors were burned out or disconnected from a power source. Without functioning exhaust ventilation, moisture and restroom/kitchen odors will tend to linger within the building.

To enhance airflow from private offices, operating fan coil units create positive air pressure, which forces air through the doorframe. Numerous areas had fan coil units

turned off or they were inoperable. Many areas of the building had office space reconfigured in a manner that decreases the efficiency of the FCUs. The air diffusers of many FCUs were blocked with books, paper and other materials. The return vents of fan coil units were also obstructed with desks and other items. All of these units must be operating in order the have the ventilation system function as designed. Air diffusers and return vents must also remain unobstructed.

A former storeroom was converted into a courtroom (Courtroom #5). In order to provide ventilation to this courtroom, new ductwork was cut into the existing HVAC system to provide fresh air. The addition of this courtroom should have required an increase in air flow velocity for the AHU servicing the basement in order to compensate for added ductwork. If the airflow velocity of this AHU was not increased after the installation of the ductwork in the basement, the ability of this equipment to provide other offices in the basement with adequate airflow would have been degraded. Decreasing the ability of the fresh air diffusers was the installation of filters within the duct (see Picture 2). The usual practice is to provide filtration within the AHU itself. By having the filters located at the air diffusers at a point farthest from the AHU, the filters can serve to prevent airflow into the new courtroom.

In order to have proper ventilation with a mechanical supply and exhaust system, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air. The date of the last servicing and balancing of these systems could not be identified.

The Massachusetts Building Code requires a minimum ventilation rate of 20 cubic feet per minute (cfm) per occupant of fresh outside air or have openable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that

the room is occupied. Providing adequate fresh air ventilation with open windows and maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being exceeded. When this occurs a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week based on a time weighted average (OSHA, 1997).

The Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches.

Temperatures were measured in a range of 71^{o} F to 77^{o} F on March 22, 2000 with one exception (CT107 with a measurement of 68^{o} F) and 71^{o} F to 76^{o} F on March 29, 2000. The majority of measurements were within the BEHA comfort guidelines. The BEHA recommends that indoor air temperatures be maintained in a range of 70^{o} F to 78^{o} F in order to provide comfort of building occupants. In many cases concerning indoor air

quality, fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply.

The relative humidity in this building was below the BEHA recommended comfort range in all areas sampled. Relative humidity measurements ranged from 11 to 32 percent on March 22, 2000 and 18 to 29 percent on March 29, 2000. The BEHA recommends that indoor air relative humidity is comfortable in a range of 40-60 percent. Relative humidity levels in the building would be expected to drop during the winter months due to heating. The sensation of dryness and irritation is common in a low relative humidity environment. Low relative humidity is a very common problem during the heating season in the northeast part of the United States.

Microbial/Moisture Concerns

Fan coil units provide both heating and air-conditioning. Each FCU has drip pans to collect and drain condensation from cooling coils. Several FCUs were examined. Each coil examined was observed to have a build up of dirt and other debris (see Picture 3), which can serve as a growth medium for mold when these units are activated for air conditioning.

Water coolers in offices were located on wall-to-wall carpeting. Use of coolers can result in repeated moistening of carpet and lead to mold growth. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that carpeting be dried with fans and heating within 24 hours of becoming wet (ACGIH, 1989). If carpets are not dried within this time frame, mold growth may occur. Water-damaged carpeting cannot be adequately cleaned to remove mold growth.

Other Concerns

After the initial assessment, BEHA staff was informed of concerns of possible carbon monoxide penetration into occupied spaces of the building. No measurable levels of carbon monoxide were measured in the courthouse. Findings concerning possible pathways for carbon monoxide to penetrate into occupied areas of the building were denoted in a previous letter (MDPH, 2000), which is included with this report as Appendix C.

Building occupants reported the presence of a urine-like odor in the clerk's office area. During the March 22nd assessment, a urine-like odor was noted in the clerk's office waiting area on the first floor, C133 jury pool room, and CT107. On March 29th, a urine-like odor was noted in the small claim's area. As noted in the BEHA letter, a pathway exists from the sewer system to the attic rooftop AHUs (see Appendix D) (SBRAA, 1981c). This building has two rooms in a penthouse/attic that contain the air handling units (AHUs). The courthouse AHUs provide air-conditioning during warm months. AHUs that provide air-conditioning require the installation of condensation drains to prevent water build up inside the casing and ductwork. The condensation drains for these units terminate above a floor drain that is connected to the building drainage system (see Picture 4). Drains are usually designed with traps in order to prevent sewer odors/gases from penetrating into occupied spaces. When water enters a drain, the trap fills and forms a watertight seal. Without periodic input of water (e.g., every other day), traps can dry out, breaking the watertight seal. Odors or other material can travel up the drain and enter the occupied space if traps are not wet. Both the floor drains and condensation drains have traps. In the heating season, AHUs do not produce condensation, which dry the traps of the condensation drains. The AHUs in the south attic room were found to be

drawing air into each unit through the condensation drains. This condition occurs because no water is produced by the AHUs to create a watertight seal in the condensation drain. With each condensation drain acting as a vacuum, odors from the floor drain can be drawn into the AHUs and be distributed to occupied areas in the building.

Several conditions noted in the building appear to implicate dry drain traps as the source of the urine odor. Building staff reported the presence of the urine odor in areas in the southern half of the building. During the March 22nd assessment, C133 jury pool room was noted to have a urine odor. Court staff report that no urine odor existed in this room the morning of the assessment. Of note was a sink that had a dry drain. Once the sink was filled with water, the urine odor dissipated. The odor was eliminated from this room after an hour. By running water into the drain of this sink, the water seal on the trap was reestablished which prevented further sewer system odors from penetrating into the room.

An incident that occurred after the BEHA assessments also indicates that the sewer system is the most likely source of these odors. A floor drain is located in the indoor garage area. Garage floor drains tend to dry due to lack of water running into them. Mr. Sheerin contacted BEHA to report that a building janitor poured an odorous cleaning product into the garage floor drain. The odor of the cleaning product promptly filled the occupied areas of the building. If cleaning product odors can be distributed into occupied areas in the building by this pathway, odors originating from the sewer can also penetrate into the building.

In addition to the AHU, FCUs in offices are equipped with condensation drains that are connected to the buildings drain system. As with the AHU, traps within the condensation drains can also dry out, resulting in the backup of sewer odors in the

building. Several offices have walk-in showers located in restrooms that are not used. Lack of water into these drains can also dry the traps, resulting in sewer odor back up.

It is unusual that the odors from the drain system consist mainly of urine odors. The source of these odors is likely to be the drain system connected to toilets in the lock up area. Since occupancy of the lock up is short term, it is likely that the waste entering into the sewer system consists mostly of urine. The close location of the drain system and the floor drains in the south AHU room connection appear to implicate the lock up waste stream as the source of odors.

Other sources of odors in the building may be attributed to the placement of exhaust vent motors on the roof. The air intakes for AHUs are located on the east wall of the attic. This allows for the entrainment of exhaust air into the supply system. This phenomenon is known as "short-circuiting". Short-circuiting can also be responsible for odors reported in the building.

The AHUs are equipped with wire mesh screens (see Picture 6). These wire mesh screens are designed to prevent large objects from entering the AHU chamber and fans. These wire mesh screens do not filter respirable dusts from the air stream. This can result in dust, dirt and other debris being distributed by the ventilation system. AHUs are usually equipped with filters that strain particulates from airflow. In order to decrease aerosolized particulates, disposable filters with increased dust spot efficiency can be installed in the AHUs. The dust spot efficiency is the ability of a filter to remove particulates of a certain diameter from air passing through the filter. Filters that have been determined by ASHRAE to meet its standard for a dust spot efficiency of a minimum of 40 percent would be sufficient to reduce airborne particulates (MEHRC, 1997; ASHRAE, 1992). Note that increased filtration can reduce airflow produced

through increased resistance. Prior to any increase of filtration, each AHU should be evaluated by a ventilation engineer to ascertain whether it can maintain function with more efficient filters.

A number of fan coil units were found without air filters. Some air filters were placed on the floor of the FCU cabinet and not in the filter rack (see Picture 7). In addition, some FCU air filters were undersized. Filters should be sized properly to fit flush with the filter rack. If not sized properly, air drawn into the FCU can bypass filters through spaces between filters and racks, resulting in dust, dirt and other debris to be distributed by the ventilation system.

Several conditions in court room #5 can have a negative impact on indoor air quality. The room is located next to the boiler room, sharing an adjoining door (see Picture 8). In order to prevent boiler room odors from penetrating into the room, this door should remain closed and sealed with weather-stripping. A suspended ceiling was installed in this room. Above this ceiling is a fan heater that is connected to the building heating system (see Picture 9). This heater was *operating*, resulting in hot air being pumped into the ceiling plenum. The heater appeared to be controlled by a thermostat in this room that is independent from the rest of the HVAC system. Since the building is air conditioned, chilled water would be expected to enter the coil pipe. This condition may result in the creation of condensation, which can wet ceiling tiles and lead to mold growth. The unit appears to have generated condensation in the past, as evidenced by the rust on the outside of the uninsulated pipe leading into the fan unit (see Picture 10). This heater should be deactivated, since its function was rendered redundant by the installation of the ventilation system and suspended ceiling.

The boiler room examined had the gas-fired furnaces operating. During the assessment, it appeared that the make up air vent for this room was closed. Gas furnaces require oxygen from air to support combustion. If the make up air vents are closed, the furnaces will draw air from the interior of the building. This condition may deprive the furnaces of an adequate air supply that can result in incomplete combustion. Incomplete combustion can result in an increased production of *carbon monoxide* from the furnace. In order to avoid this condition, the makeup air vents should be opened to allow for an adequate supply of oxygen to these furnaces.

The building shows signs of rodent infestation. Mouse wastes were noted behind computers on desks in the clerk's office, behind floor dividers and inside of FCU cases (see Pictures 11, 12, and 13). In addition, several materials showed signs that rodents were present (see Picture 14). Rodent infestation can result in indoor air quality related symptoms due to materials in their wastes. Mouse urine contains a protein that is a known sensitizer (US EPA, 1992). Of particular note was the presence of rodent wastes in the interior of FCU cases. FCUs without filters can draw particulate materials into the air stream, and distribute these materials into occupied areas. It is important that proper filters be installed in FCUs to avoid this problem. A three step approach is necessary to eliminate rodent infestation:

1. removal of the rodents;
2. cleaning of waste products from the interior of the building; and
3. reduction/elimination of pathways/food sources that are attracting rodents.

To eliminate exposure to allergens, rodents must be removed from the building. Please note that removal, even after cleaning, may not provide immediate relief since allergens can exist in the interior for several months after rodents are eliminated (Burge, 1995). A

combination of cleaning, increases in ventilation and filtration should serve to reduce rodent associated allergens once the infestation is eliminated.

The fresh air intake for the basement AHU is located within a cyclone fence enclosure next to the garage door (see Picture 15). The fresh air intake is connected to the AHU that provides air for the vault in the clerk's office. Sheriff's vans were noted parked next to the cyclone fence. It is possible that idling vans can produce exhaust that can be entrained and distributed to the interior of the building by the basement AHU. M.G.L. chapter 90 section 16A prohibits the unnecessary operation of the engine of a motor vehicle for a foreseeable time in excess of five minutes (MGL, 1986).

Employees were observed burning candles in the clerk's restroom. Scents, candle waxes or tallow can produce odors that are irritating to the eyes, nose and throat. Candles are also a fire hazard in an office building.

Conclusions/Recommendations

The solution to the indoor air quality problem at the Bristol County 3rd District Courthouse is complex. The combination of the general conditions, lack of exhaust ventilation, odor entrainment by AHUs, lack of filtration of ventilation equipment, and rodent infestation, if considered individually, would present conditions that can serve to degrade indoor air quality in a building. When combined, these conditions can serve to further affect indoor air quality in the building. Some of these conditions can be remedied by actions of building occupants. Some remediation efforts will require alteration to the building structure and equipment. For these reasons a two-phase approach is required, consisting of more immediate **(short term)** measures to improve air quality and **long term** measures that will require planning and resources to adequately

address the overall indoor air quality concerns. In view of the findings at the time of this visit, the following recommendations are made:

Short Term Recommendations

1) Implement corrective actions recommended in letter concerning carbon monoxide as soon as possible (see Appendix A). These and other short term recommendations include:
   a) Seal the floor drain in the garage.
   b) Ensure water is poured into the AHU floor drains every other day to maintain the integrity of the traps.
   c) Seal the condensation drains for AHUs during the heating season. Please note that these drains must be unsealed during the air-conditioning season in odor to drain condensation. Failure to remove condensation drain seals can result in water back up into AHUs and produce mold growth.
   d) Seal holes around utility pipes in the ceiling of the garage. Render wall seams or other breaches in the walls and ceiling airtight.
2) Activate exhaust vent motors and operate during business hours. If exhaust vent motors are broken, repair.
3) In order to decrease aerosolized particulates, disposable filters with an increased dust spot efficiency can be installed in the AHUs and FCU. The dust spot efficiency is the ability of a filter to remove particulates of a certain diameter from air passing through the filter. Filters that have been determined by ASHRAE to meet its standard for a dust spot efficiency of a minimum of 40 % would be sufficient to reduce airborne particulates (MEHRC, 1997; ASHRAE, 1992). Note

that increased filtration can reduce airflow produced by the heat pump by increased resistance. Prior to any increase of filtration, each heat pump should be evaluated by a ventilation engineer as to whether the heat pump can maintain function with more efficient filters.

4) Operate FCUs to facilitate airflow in office areas.

5) Consider consulting a ventilation engineer to maximize the amount of fresh air drawn through the fresh air vents. Once the fresh air supply and exhaust systems are functioning, have the system balanced.

6) Examine the feasibility of increasing the performance of the AHU servicing courtroom #5 to increase fresh air distribution.

7) Repair restroom exhaust fans. Operate restroom exhaust vents during business hours.

8) To control odors distributed by AHUs, the recommendations related to drains in the attic AHU rooms will serve to reduce other odors emanating from floor drains. It is imperative that once the AHUs are switched to air conditioning mode that stoppers in the condensation drains be ***removed***. *Failure to remove stoppers can result is water backup into the AHU cabinet which can produce mold growth.*

9) Remove electrical power source to heater above ceiling of courtroom #5.

10) Remove filters from the return air vents of court room #5.

11) Deactivate the heater in the ceiling of courtroom #5. Prevent chilled water from filling the coil of this unit to prevent the generation of condensation.

12) Render the door between courtroom # 5 and the furnace room airtight with weather stripping.

13) Ensure that the furnace have adequate make up air to produce complete combustion of fuel.

14) Seal all unused/unnecessary drains to prevent odor back up from the sewer system.

15) Disinfect the drip pans in FCUs with an appropriate antimicrobial agent and clean debris from drip pans.

16) Consider placing a water impermeable barrier beneath water cooler to prevent moistening of carpet.

17) Rodent droppings should be cleaned from all work areas as well as the interior of each FCU. This may require the moving of equipment and office dividers to clean inaccessible areas. The use of a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner is recommended to avoid aerosolization of rodent related allergens. Wet extraction cleaning of carpets may be necessary.

18) It is highly recommended that the principles of integrated pest management (IPM) be used to rid this building of pest. A copy of the Massachusetts IPM recommendations are included with this report as Appendix E (MDFA, 1996). Activities that can be used to eliminate pest infestation may include the following activities.

a) Rinse out recycled food containers. Seal recycled containers with a tight fitting lid to prevent rodent access.

b) Remove non-food items that rodents are consuming.

c) Stored foods in tight fitting containers.

d) Avoid eating at work stations. In areas were food is consumed, periodic vacuuming to remove crumbs is recommended.

e) Regularly clean crumbs and other food residues from toasters, toaster ovens, microwave ovens, coffee pots and other food preparation equipment.

f) Holes as small as ¼" is enough space for rodents to enter an area. Examine each room and the exterior walls of the building for means of rodent egress and seal. If doors do not seal at the bottom, install a weather strip as a barrier to rodents.

g) Reduce harborages (cardboard boxes) where rodents may reside.

19) Relocate van parking or have vans shut off engines after five minutes as required by Massachusetts General Laws 90:16A.

20) For buildings in New England, periods of low relative humidity during the winter are often unavoidable. The use of industrial fans to create airflow in the hallways may be reducing relative humidity levels in the building, further drying the interior. Scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a HEPA filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

Long Term Recommendations

1) Consider placing a solid barrier between fresh air intakes and exhaust vents on roof to prevent short circuiting. An alternative is to raise exhaust vents several feet above top level of the AHU fresh air intakes.

2) Consider extending the height of the chimney several feet above the top height of the AHU fresh air intake that is northeast of the chimney.

3) Consider installing exhaust ventilation for the garage.

4) Examine drain pipe traps at the basement level that may be cracked and leaking. This condition can result in traps drying.

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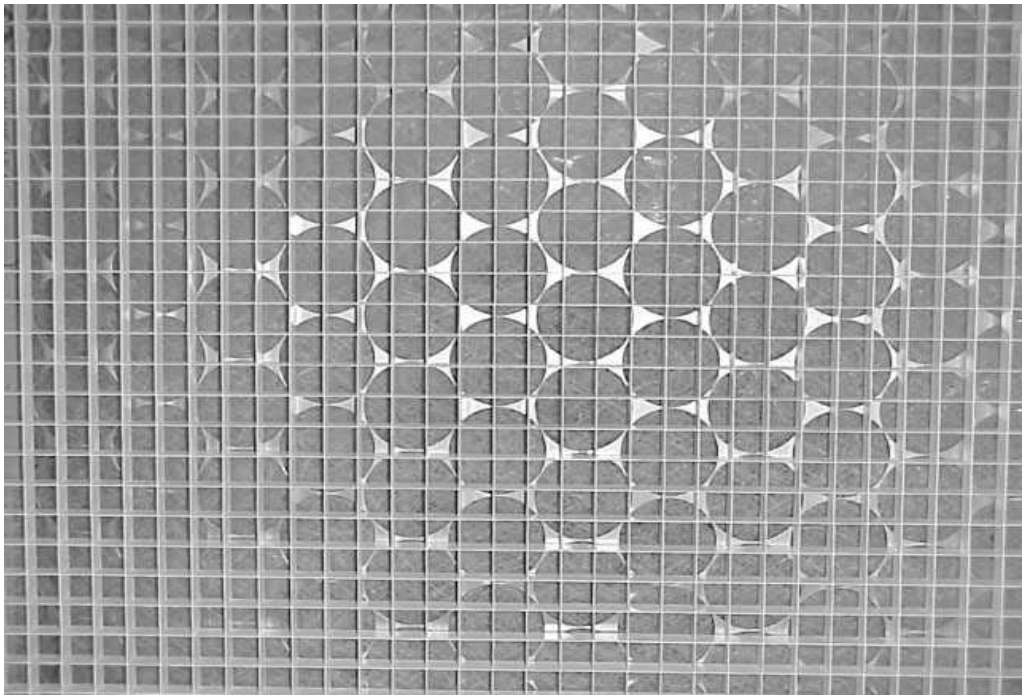
Picture 1

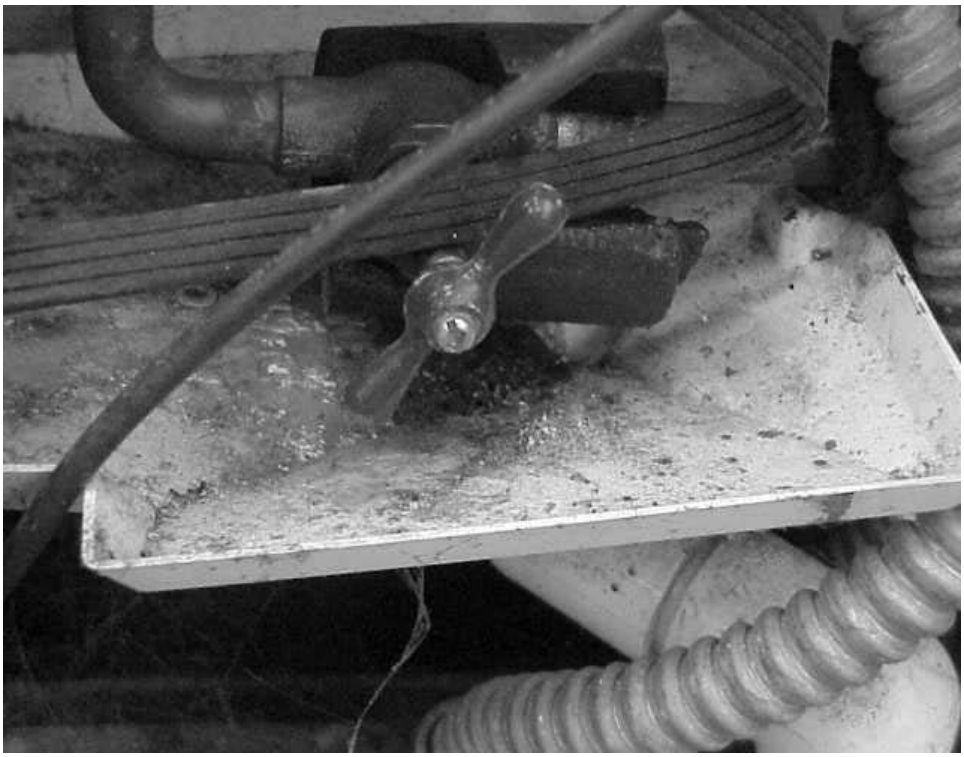
Exhaust Vent Fan on Roof, Note Close Proximity to Fresh Air Intake of AHUs

Picture 2



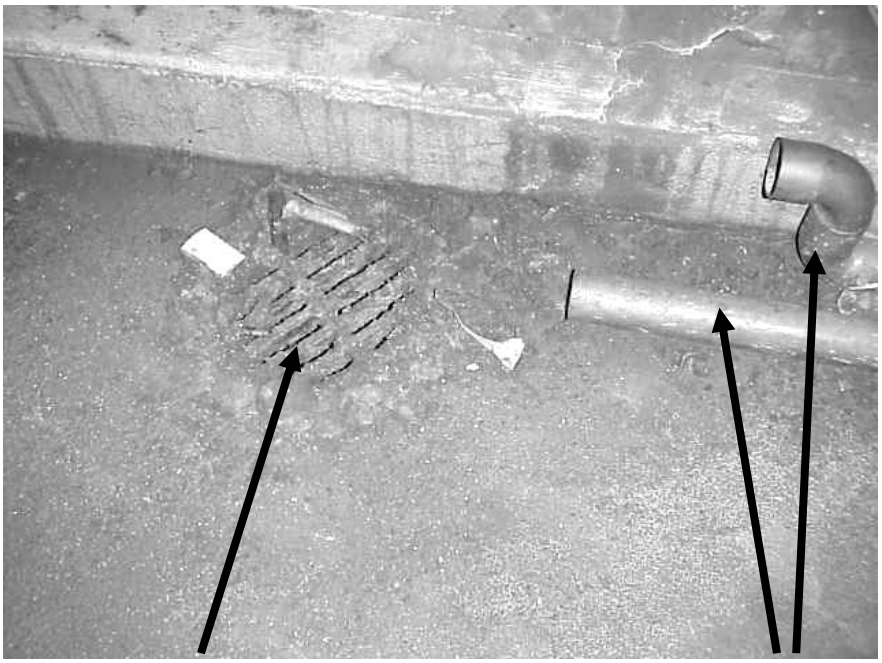
Filter Installed Inside of Return Vent in Courtroom #5

Picture 3



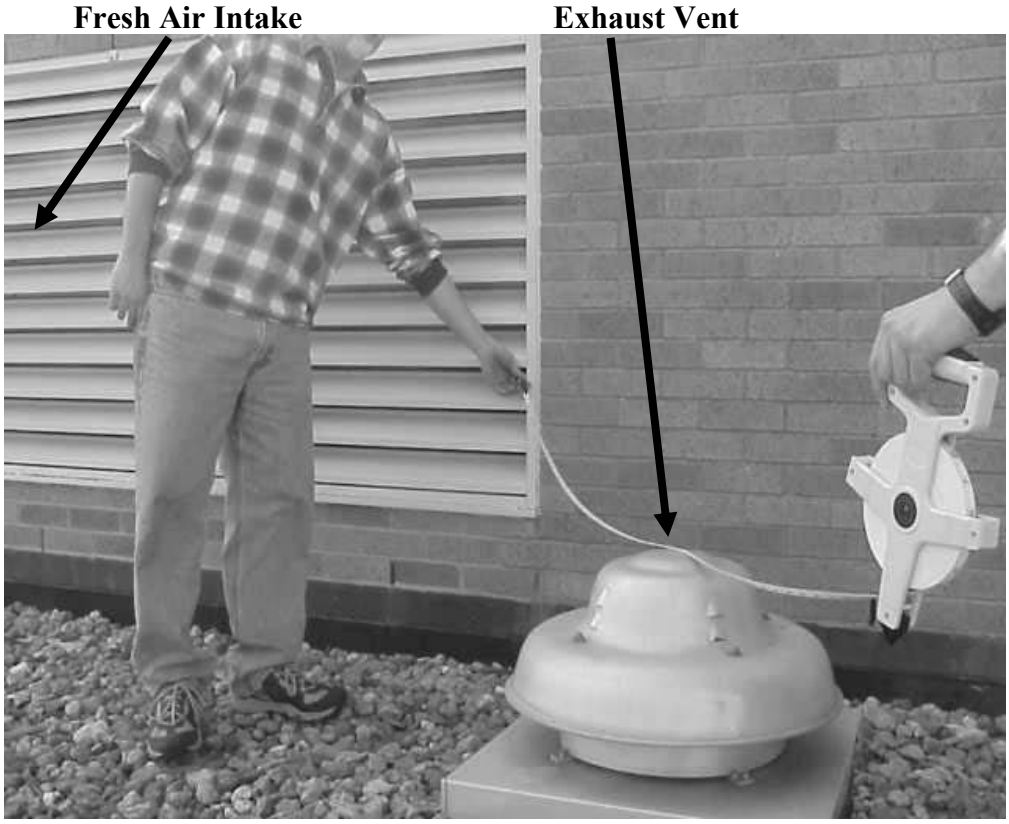
Drip Pan in FCU Caked with Debris

Picture 4



AHU Drainpipes That Terminate over Floor Drain

Picture 5



Exhaust Vent within 3 feet of AHU Fresh Air Intake

Picture 6

Wire Mesh Screens in AHU

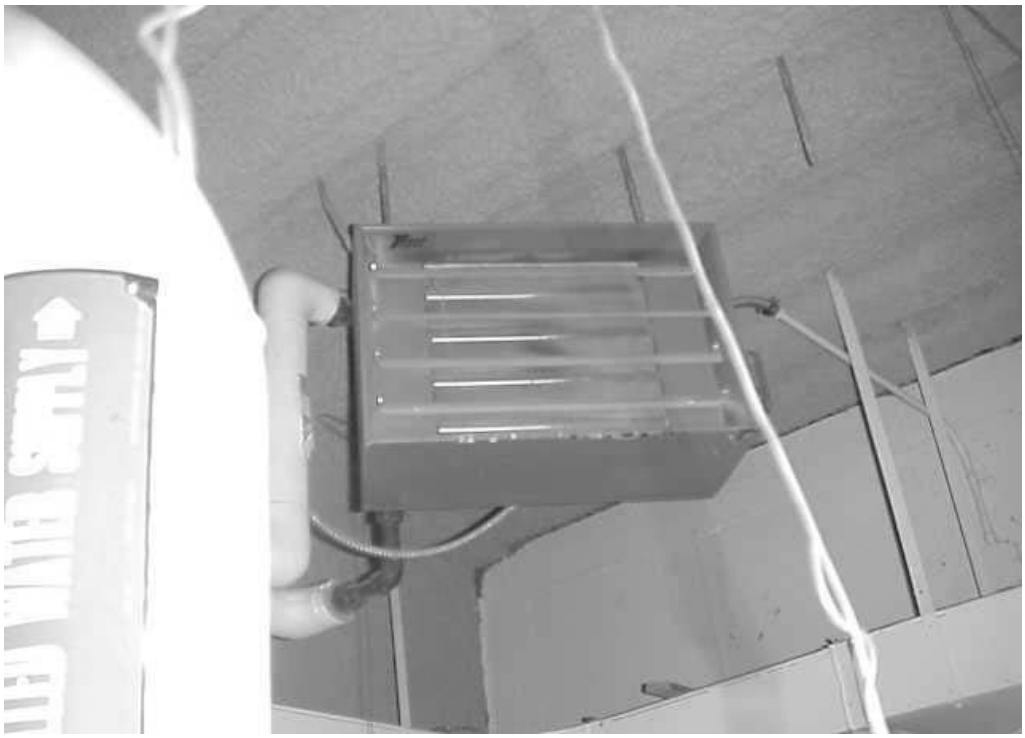
Picture 7

Filter Placed on Floor of FCU Cabinet

Picture 8

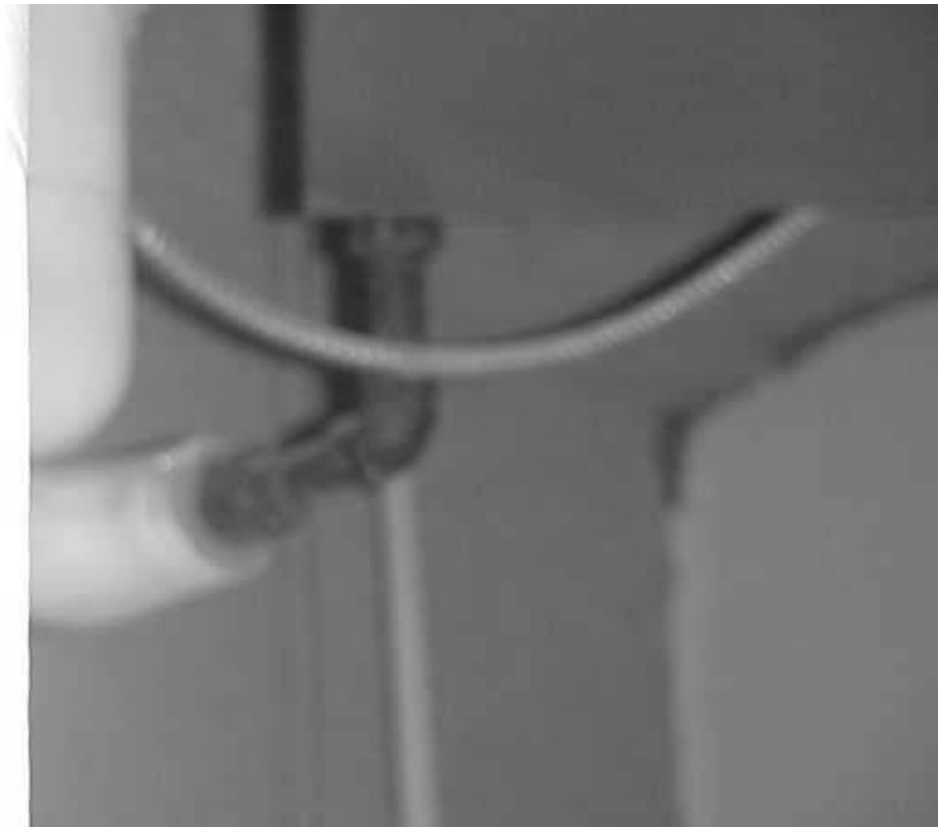
Door Leading to Furnace Room from Courtroom #5

Picture 9



Fan Heater above Ceiling of Courtroom #5

Picture 10

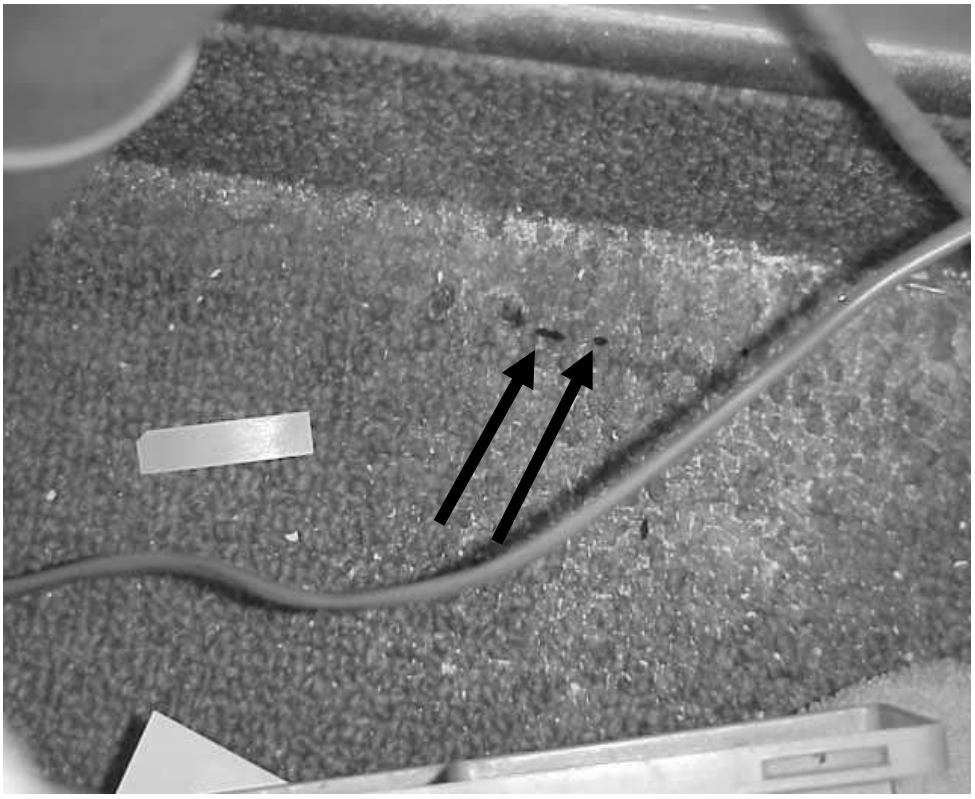


Close Up of Corroded Pipe of Heater above Ceiling of Courtroom #5

Picture 11

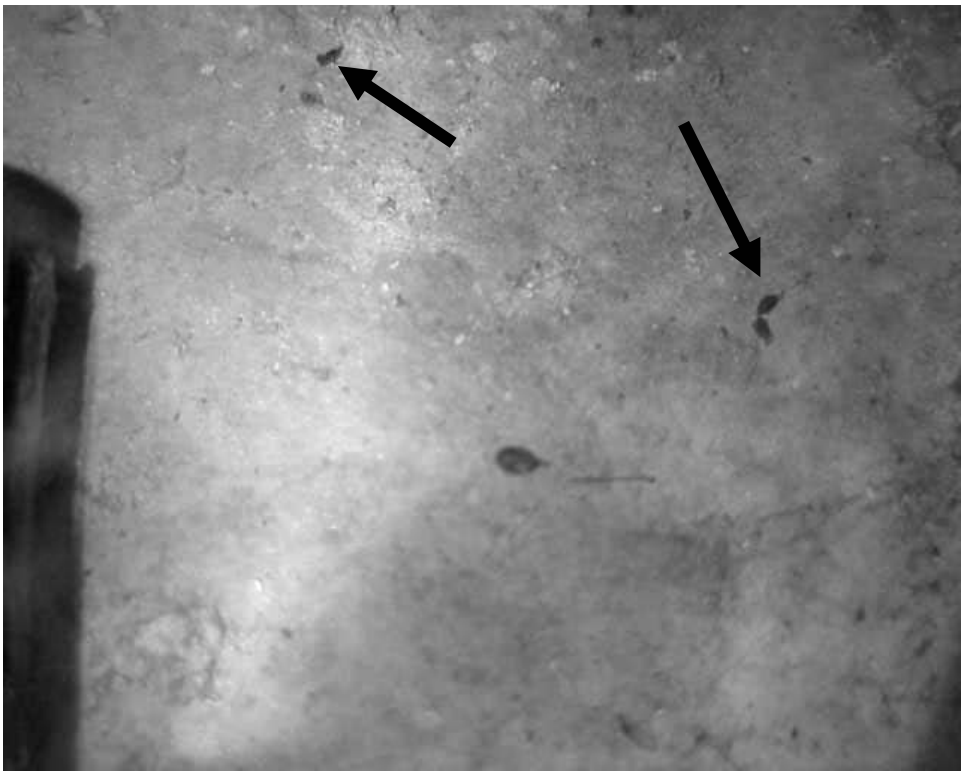
Rodent Droppings on Desk in Clerk's Office

Picture 12



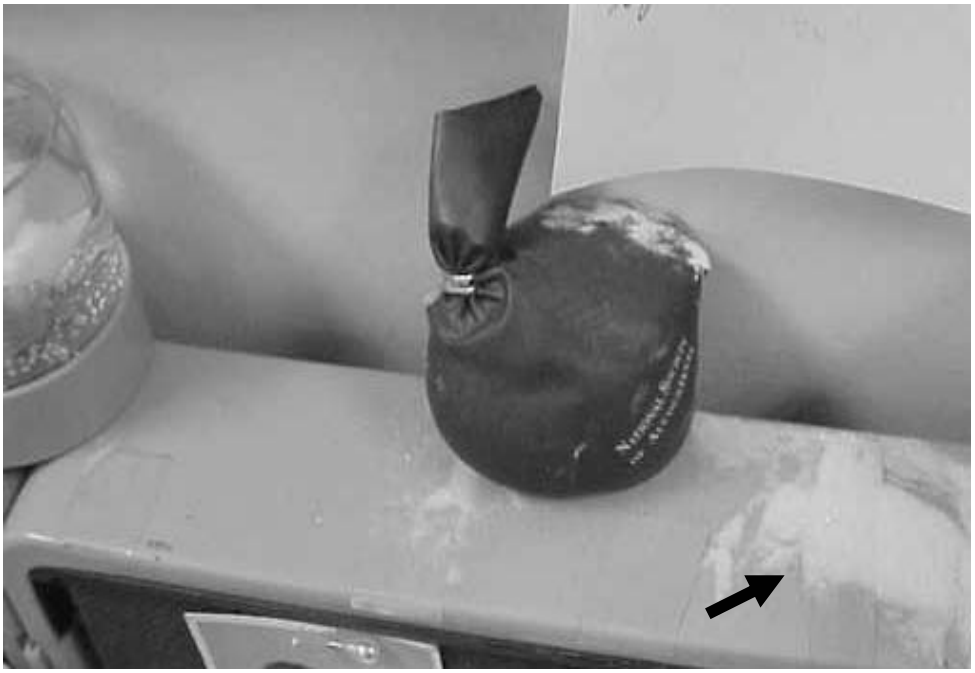
Rodent Droppings on Carpet of Clerk's Office

Picture 13



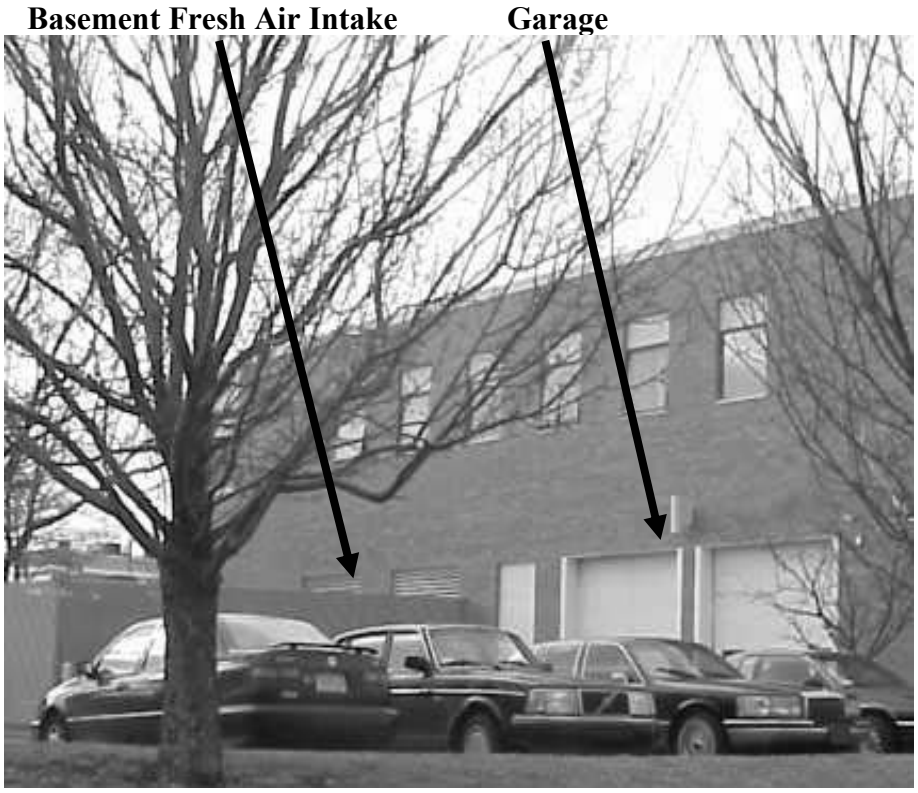
Rodent Droppings inside FCU Cabinet in Courtroom #4

Picture 14



Item Purported Masticated by Rodents, Note Sack Filling on Flat Surface

Picture 15



Position of Basement AHU Fresh Air Intakes to Garage

TABLE 1

Indoor Air Test Results –Bristol County 3rd District Court, NewBedford, MA – March 22, 2000

Remarks	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Outside (Background)	438	50	44					
C T 107	1005	68	32	0	no	yes	yes	urine odor
Courtroom 2	1432	75	24	27	no	yes	yes	floor fan
Courtroom 1	1188	75	21	26	no	yes	yes	
Courtroom 3	1220	74	23	9	no	yes	yes	
Courtroom 5	830	71	24	0	no	yes	yes	exhaust off, mice droppings
Juvenile Waiting Area	984	74	26	12	no	yes		
Juvenile Court	858	73	21	10	no	yes	yes	
Lock-up Control	1035	74	23	3	no	yes	yes	
G 34	924	73	28	4	no	yes	no	
G C 27						no	yes	exhaust off

*** ppm = parts per million parts of air**
CT = water-damaged ceiling tiles

Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 2

Indoor Air Test Results –Bristol County 3rd District Court, NewBedford, MA – March 22, 2000

Remarks	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Courtroom 4	1007	74	22	2	no	yes	yes	
C 133 Jury Pool	1179	75	21	0	no	yes	yes	supply off, urine odor, mice droppings in water cooler casing
C 113 Library	1014	74	21	0	no	yes	yes	
Clerk's Office inner	877	77	21	7	no	yes	yes	
Clerk's Office outer	908	77	11	5	no	yes	yes	
154	741	75	18	0	no	yes	no	
146	938	71	23	2	yes	yes	no	
150 – Assistant Magistrate	780	73	21	2	yes	yes	no	dry drain trap, door open
Chief Justice Chamber	692	73	17	0	yes	yes	no	shower, dry drain trap
Lobby/Reception	519	73	21	1	yes	yes	no	

*** ppm = parts per million parts of air**
CT = water-damaged ceiling tiles

Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 3

Indoor Air Test Results – Bristol County 3rd District Court, NewBedford, MA – March 29, 2000

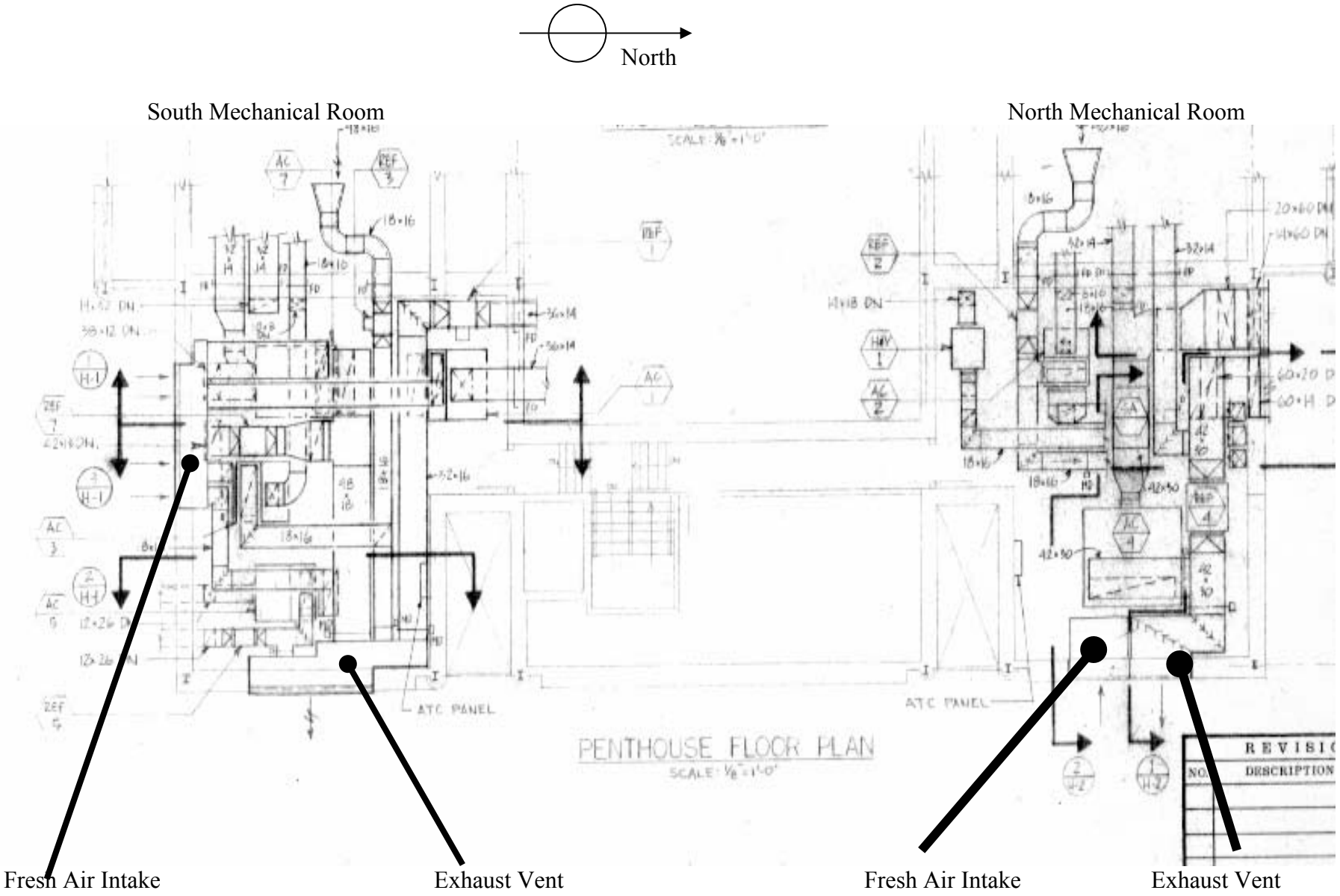
Remarks	Carbon Monoxide *ppm	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
							Intake	Exhaust	
Outside (Background)	non detectable	435	58	22					
Switchboard	non detectable	790	72	23	2	no	yes	yes	
107 Restroom	non detectable						no	yes	exhaust off
Courtroom 1	non detectable	729	72	23	3	no	yes	yes	
Courtroom 2	non detectable	820	73	24	12	no	yes	yes	
C 112	non detectable	742	75	21	0	no	yes	no	
C 112 Restroom	non detectable						no	yes	
C 133	non detectable	711	74	20	0	no	yes		
C 133 Restroom	non detectable						no	yes	exhaust off
C 125	non detectable	790	75	21	3	no	yes	yes	exhaust off
Courtroom 3	non detectable	948	76	29	15	no	yes	yes	door open

*** ppm = parts per million parts of air**
CT = water-damaged ceiling tiles

Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

Appendix A **Blueprint for Penthouse South Mechanical Room**

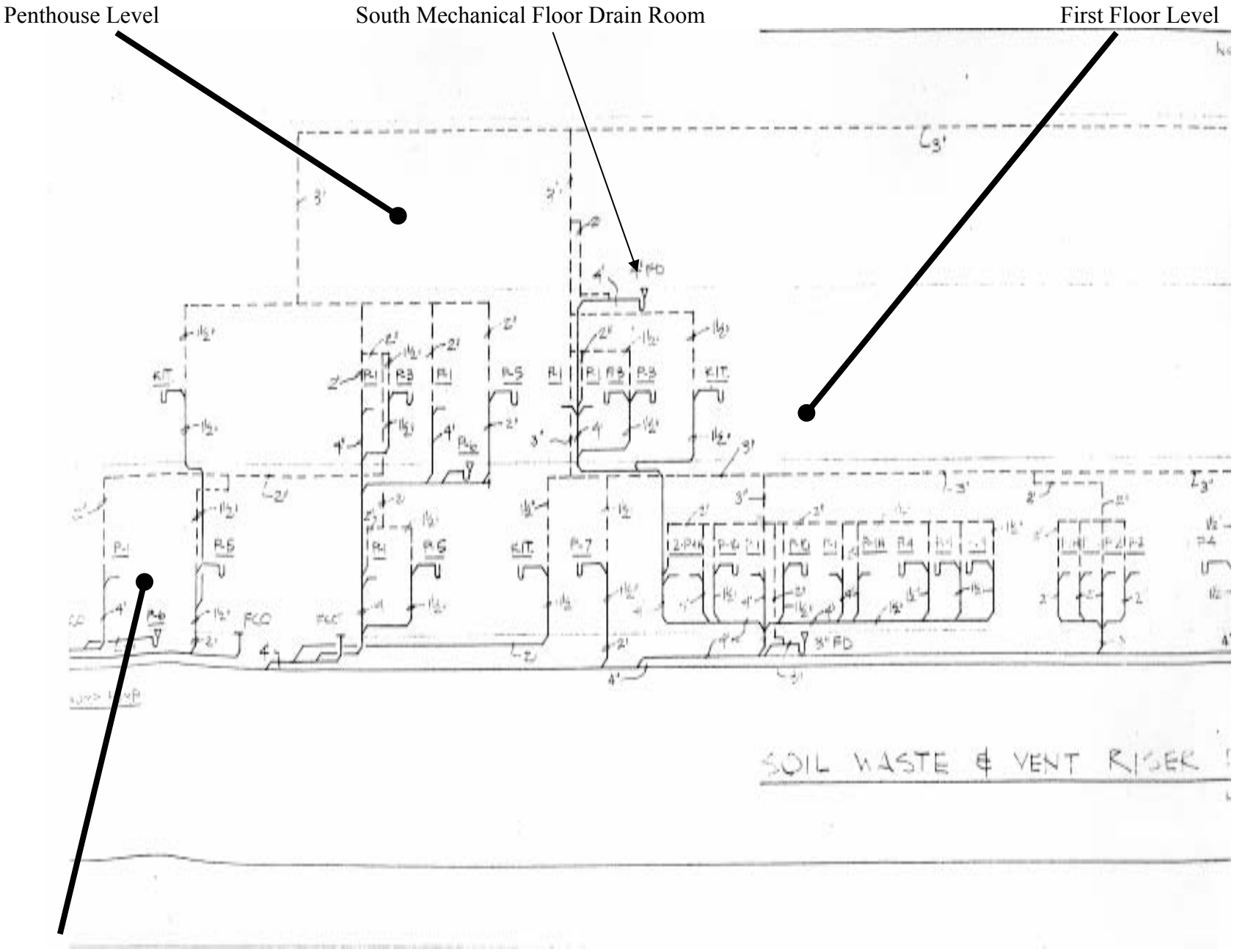


Appendix B **Blueprint Reference List for Exhaust Fans (EF) Note that Most Service Restrooms or Mechanical Systems**

FAN SCHEDULE

ITEM NO.	MODEL	TYPE	SERVICE	CFM	SP IN	RPM	HP	V	PH	HZ	
[illegible]	21	IN-LINE	AC-1	[illegible]	1/2	1197	3/4	208	3	60	A[illegible]
[illegible]	15		AC-2	1720		1564	1/2	208	3		
[illegible]	15		AC-3	1760		1576	1/2	208	3		
[illegible]	36		AC-4	12,940		785	3	208	3		AL
[illegible]	16		AC-5	1920		1703	1/2	208	3		AL
[illegible]	16		AC-6	1010		1092	1/4	120	1		
[illegible]	21		AC-7	6120		1212	1 1/2	208	3		
[illegible]	16		AC-8	1000		1092	1/4	120	1		
EF-1	[illegible]	ROOF	TOILETS	60	1/8"	1145	1/25	120	1	60	W
EF-2				60	1/4"	1135	1/25				
EF-3				180	3/8"	1445	1/25				
EF-4	40 DRE BX			155	3/8"	1200	1/10				
EF-5	22 RRE BB			275	3/8"	1270	1/6				
EF-6	40 DRE BX			240	3/8"	1280	1/10				
EF-7	30 DRE BX			120	1/8"	1184	1/25				
EF-8	22 RRE BB			900	1/2"	1223	1/6				
EF-9	40 DRE BX		ELEC. RM	200	3/8"	1250	1/4				
EF-10	[illegible] DRE BX		ELEC. RM.	375	3/8"	1450	1/6				
EF-11	[illegible] DRE BX		TOILETS	255	3/8"	1290	1/10				
EF-12	70 DRE BX		KITCHEN	105	1/8"	1025	1/10				
EF-13	165 B1C BF	IN-LINE	MECH. RM.	2329	1/4"	1072	1/2	208	3	60	
CF-1	Z-8	CEILING	LOUNGE-CONF. RM.	200	1/8"	1050	1/10	120	1	60	
CF-2	Z-10	CEILING	LOUNGE	375	1/8"	1050	1/10	120	1	60	

Appendix D **Blueprint Denote Pipe Riser Connections of Penthouse Floor Drain to Toilets**



Appendix C

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

ARGEO PAUL CELLUCCI
GOVERNOR

JANE SWIFT
LIEUTENANT GOVERNOR

WILLIAM D. O'LEARY
SECRETARY

HOWARD K. KOH, MD, MPH
COMMISSIONER

May 2, 2000

The Honorable Barbara Dortch-Okara
Chief Justice for Administration and Management
Administration Office of the Trial Court
2 Center Plaza, 5th floor
Boston, MA 02108

Dear Judge Dortch-Okara:

In response to request from building occupants, two visits to assess indoor air quality were conducted at the Bristol County 3rd District Court, 75 North Sixth Street, New Bedford, MA. This assessment was conducted by the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health Assessment (BEHA). A number of complaints concerning indoor air quality were made by employees, including a persistent urine odor in the southern half of the building.

On March 22, 2000, a visit was made to this building by Michael Feeney, Chief of Emergency Response/Indoor Air Quality (ER/IAQ), BEHA. Subsequent to this visit, concerns about carbon monoxide levels within the Bristol County 3rd District Court were made to BEHA staff by building occupants. On March 29, 2000, Mr. Feeney returned to the building to conduct carbon monoxide testing. This letter details the results of carbon monoxide testing. Also noted are the conditions that may contribute to carbon monoxide penetration into the building. Findings concerning other indoor air quality related issues found during both inspections will be provided in a follow up report.

No detectable levels of carbon monoxide were measured during the March 29, 2000 assessment (see Table). While carbon monoxide was not detected during the visit, several conditions concerning the configuration/design of the building may provide conditions for carbon monoxide penetration into the building. During this assessment, the building furnaces were deactivated due to fair weather. The chimney for the furnaces extends above the surface of the roof at a height of three feet (see Picture 1). Northeast of the building is a fresh air intake for sections of the heating, ventilating, and air-conditioning (HVAC) system that services the southern section of the building. The top of this fresh air intake is ***five*** feet above the surface of the building. During weather with a southwest wind, furnace pollutants can travel from the chimney towards the HVAC system fresh air intake. Furnace pollutants (which may include

carbon monoxide) can be entrained into this vent and distributed into the occupied spaces of the southern section of the building.

Another possible source of carbon monoxide is the indoor garage located on the ground floor of the southern section of the building. This garage is used to deliver prisoners for trial. After the prisoner transport vans enter the garage, the garage door is closed by an automatic system. Several pathways exist for vehicle exhaust to penetrate into the occupied areas of the building. The ceiling of the garage has several spaces through the floor decking through which air may pass. Building occupants reported an incident involving the motor for the garage door opener burning out. Related odors were noted in the clerk magistrate's office. Since smoke involves heated particles rising, odors from this burnt out motor may have penetrated the area above the garage through these holes. Vehicle exhaust from the prisoner transport vans may also follow the same pathway.

The final possible pathway involves the building ventilation system. This building has two rooms in a penthouse/attic that contain the air handling units (AHUs). The southern attic room contains the AHUs that service courtroom 1, courtroom 3, the lock up area and adult clerk's office. The courthouse AHUs are equipped to provide air-conditioning during warm weather months. AHUs that provide air-conditioning require the installation of condensation drains to prevent water build up inside the casing and ductwork. The condensation drains for these units terminate above a floor drain that is connected to the building drainage system (see Picture 2).

Drains are usually designed with traps in order to prevent sewer odors/gases from penetrating into occupied spaces. When water enters a drain, the trap fills and forms a watertight seal. Without periodic input of water (e.g., every other day), traps can dry and compromise the integrity of the watertight seal. If traps dry out, odors or other material can travel up the drain and be distributed to occupied areas by the ventilation system. Both the floor drains and condensation drains have traps.

During this assessment, the AHUs were found to be drawing air through the condensation drains. This condition occurs because no water is produced by the AHUs during the heating season to create a watertight seal in the condensation drain. With each condensation drain acting as a vacuum, odors from floor drains without water-sealed traps can be drawn into the AHUs and distributed to occupied areas within the building.

Of note is the existence of a floor drain in the indoor garage area. Garage floor drains also tend to dry due to lack of water running into the drain. Since the garage does not have mechanical exhaust vents, the operation of prisoner transportation vans can result in vehicle exhaust penetrating into the floor drain. Once in the drain system, vehicle exhaust can migrate up the floor drain system to the south AHU room floor drain. Following this, vehicle exhaust can be drawn into the AHUs through the condensation drains and be distributed into occupied areas serviced by the AHUs. Vehicle exhaust also contains carbon monoxide.

Subsequent to this assessment, Mr. Sherrin reported an incident that appeared to confirm the garage floor drain/AHU pathway. Reportedly, a building janitor poured an odorous cleaning

product into the garage floor drain. The odor of the cleaning product promptly filled the occupied areas of the building. If cleaning product odors can be distributed into occupied areas in the building by this pathway, carbon monoxide entering into the garage floor drain system can also enter the building.

In each of these cases, pathways for carbon monoxide entrainment exist in this building. In order to prevent carbon monoxide penetration, the following recommendations should be considered:

1. Seal the floor drain in the garage.
2. Ensure water is poured into the AHU floor drains every other day to maintain the integrity of the traps.
3. Seal the condensation drains for AHUs during the heating season. Please note that these drains must be unsealed during the air-conditioning season in odor to drain condensation. Failure to remove condensation drains seals can result in water back up into AHUs and produce mold growth.
4. Seal holes around utility pipes in the ceiling of the garage. Render wall seams or other breaches in the walls and ceiling airtight.
5. Consider extending the height of the chimney several feet above the top height of the AHU fresh air intake that is northeast of the chimney.
6. Consider installing exhaust ventilation for the garage.

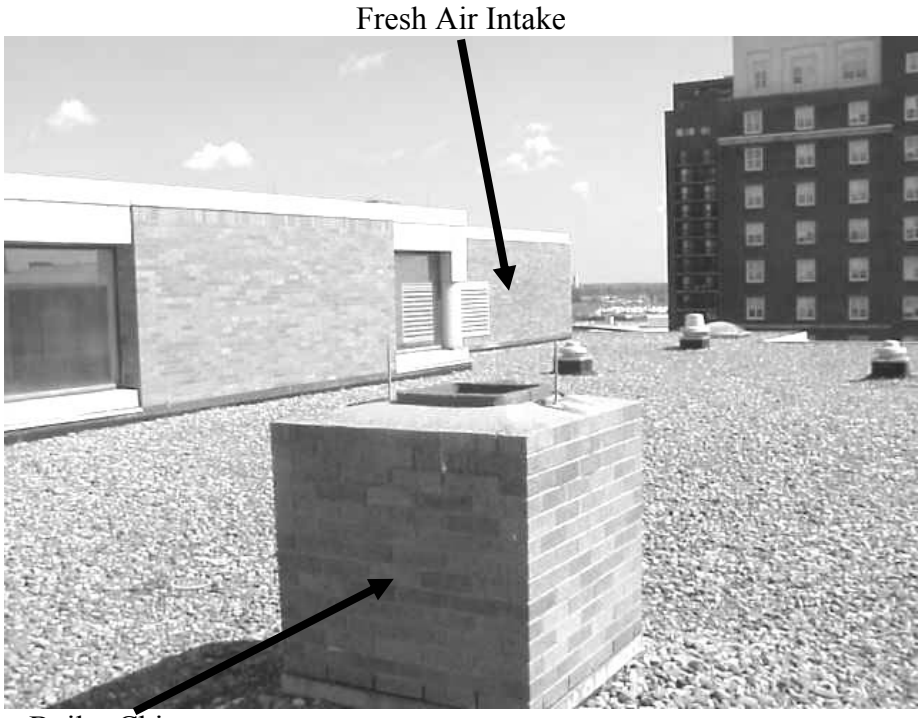
We believe that the indoor air quality within this building can be improved with the implementation of these recommendations. We hope you find this information helpful. If you are in need of further information or help, please feel free to contact Michael Feeney or me at (617) 624-5757.

Sincerely,

Suzanne K. Condon, Director
Bureau of Environmental Health Assessment

cc: Mike Feeney, Chief, Emergency Response/Indoor Air Quality, BEHA
Lynne G. Reed, Executive Director, Administrative Office of the Trial Court
Stephen J. Carroll, Director of Court Facilities
Joanna Rugnetta, Health and Safety Liaison
Hon. Rosemary Minehan, Acting Presiding Judge, Bristol County 3rd District Court
Senator Mark C. Montigny
Representative Antonio F. D. Cabral
Representative Robert M. Koczera
Representative George Rogers

Picture 1



Boiler Chimney Southwest of Fresh Air Intake

Picture 2

AHU Drainpipes That Terminate over Floor Drain

TABLE 6
Carbon Monoxide Air Test Results
Bristol County 3rd District Court
March 29, 2000

Remarks	Carbon Monoxide *ppm
Outside (Background)	non-detectable
Switchboard	non-detectable
Court 1	non-detectable
Court 2	non-detectable
C112	non-detectable
C133	non-detectable
C125	non-detectable
Court 3	non-detectable
Clerk's Window	non-detectable
Clerk's Main Work Area	non-detectable
152	non-detectable
Vault	non-detectable
Small Claims	non-detectable
154	non-detectable
150	non-detectable
146	non-detectable
C107	non-detectable
Restraining Orders	non-detectable
103 south	non-detectable
103 north	non-detectable

*** ppm = parts per million parts of air**